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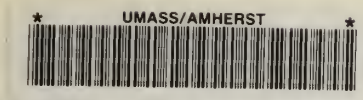

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POSITION PAPER

OF THE

COMMONWEALTH OF MASSACHUSETTS

CONCERNING INTER-CITY TRANSPORTATION

IN THE

NORTHEAST CORRIDOR

MICHAEL S. DUKAKIS
Governor

FREDERICK P. SALVUCCI
Secretary of Transportation

EXECUTIVE SUMMARY

Report Prepared by:
Matthew A. Coogan
Undersecretary of Transportati
July 1986

Position Paper by the Commonwealth of Massachusetts
Concerning Intercity Transportation for the Northeast Corridor

EXECUTIVE SUMMARY

OVERVIEW. The promise of the Northeast Corridor Rail project has not been fulfilled. The job has been left half finished, with an admirable product from Washington to New York, but virtually no improvement over historic running times from New York to Boston. The basic rationale for the full Northeast Corridor program has not been changed by the reality of the past decade: it has been confirmed. Explosive growth precisely along the stations of the Boston-New York rail Corridor has occurred, sooner than envisioned. Over the planning period, a relatively stable population along the Corridor is experiencing a doubling of income power [expressed in constant dollars.] Over the past seven years, non-highway travel between Boston and New York has grown by an astonishing 43%, making it the strongest "city-pair" public travel market in the country, and perhaps in the world. The world of Boston and Providence has become integrally inter-related with the world of New York, New Jersey and southwestern Connecticut.

THE PRESENT SYSTEM OF INTERCITY TRANSPORTATION IS EXTREMELY FRAGILE. Our present system of intercity transportation in the northern portion of the Northeast Corridor is extremely fragile, and subject to sudden and paralyzing disruption: we can document how it will worsen over time if we do not take action now. The present system, dependent upon air for time-sensitive, and highway for less time-sensitive movement, can be disrupted by a foggy rain shower at Laquardia, or a dusting of snow at National airport: every experienced traveller in the Corridor understands this and must plan for the worst. With all of the hoped-for technological promise, the FAA has concluded that 60-70% of air traffic delay is due to weather, and may be unavoidable.

AIRPORT DELAY IS REAL, AND GROWING CONGESTION WILL MAKE IT WORSE. In spite of hopes that changes [such as deregulation and improved management techniques] would lessen airport congestion problems, the FAA has concluded that "the number of delayed operations was 37% higher in 1985 than in 1983." The duration of delay increases as the incidence of delay increases. The average duration of delay has risen consistently over the past decade, and FAA studies show how further delay will inevitably result from growing airport operations levels at airports with finite field capacity. Between 1984 and 1995, major airport operations will grow by 62%, against a background reality of nearly fixed airside capacity. Some Northeast Corridor airports, such as Laguardia and National cannot expand operations at all. This month the FAA has suggested that others, such as Boston's Logan, will soon require the imposition of an externally imposed cap on the number of additional airport operations. Airline deregulation - far from "solving" the problem of airport and air

Corridor capacity, has actually resulted in a significant decrease in the average number of passengers per flight, and a resulting increase in the total number of operations.

THE UNIQUE PROBLEM OF BOSTON-NEW YORK MARKET. Boston and New York will soon be operating with a finite number of "slots" of aircraft operation to be utilized. Yet, 40% of all Logan domestic carrier flights go to one place: New York. If fewer of these scarce "slots" were allocated to Boston/New York service, more could be opened up for markets that cannot reasonably be served by alternative modes, in this case High Speed Northeast Corridor Rail.

THE PROMISE OF BOSTON-NEW YORK HIGH SPEED RAIL. The unfinished Northeast Corridor project must be brought to its agreed-upon completion. Three-hour rail service from Boston to New York is obtainable by continuing the already-successful level of service provided from Washington to New York. This requires no new rail Corridor right of way, nor the use of any technology which has not been successfully applied and demonstrated on the Corridor already. Three-hour service can be established between Boston and New York by the implementation of the long-agreed-upon program of electrification north of New Haven, and a continued program of track-bed and state-of-the-art rail vehicle technology.

RADICAL RAIL TECHNOLOGY IS NOT NEEDED. Impressive as France's Paris to Lyon "TGV"* or Japan's Hokaido Express may be, we do not even need such major improvements to rail technology to attain speeds which meet or beat air travel times in many of the major Corridor city pairs. For example, the adoption of non-stop service from Washington to New York over existing track could provide service of 2 hours and 22 minutes [at 120/125 mph rail service], which would provide door to door travel service superior to air travel times. Adoption of TGV-type 160 mph top speed service would yield very little time advantage at major cost to other Corridor rail services.

ELECTRIFICATION FROM NEW HAVEN TO BOSTON IS THE IMMEDIATE PRIORITY WITHIN THE NORTHEAST CORRIDOR. As part of a incremental package of improvements, electrification would cut some 44 minutes of travel time from the Boston/New York Trip. A further package of moderate scale track improvement, and time-tested train equipment improvements could further improve travel time by some 15 minutes, attaining the long established policy goal of 3 hour service from Boston to New York. There is no other investment package examined by FRA which is as cost effective as the full electrification package noted above. The service south of New York has reached a plateau not yet attempted on the northern segment of the full project. FRA cost/benefit data suggests that the candidate package of improvements including electrification north of New Haven is twice as cost/effective as the similar scale candidate investment package south of New York.

*TGV = "Tres Grandes Vitesse", or, very high speed service.

THE "AIR VS RAIL" DEBATE SHOULD STOP. We have no choice but to develop a balanced high speed inter-city program for the Northeast Corridor, with major capacity contributions from both air and rail services. In Germany, the national airline, Lufthansa, actually operates high-speed rail service from its Frankfurt Airport base. In Switzerland, Swiss Federal Railroad personnel are trained to check-in air passengers at every city rail station for all flights out of Switzerland. Throughout Europe high speed inter-city rail is seen as an essential, complementary service to longer distance air service.

WE MUST TAKE ACTION NOW TO PROVIDE FOR ADEQUATE HIGH SPEED INTER-CITY SERVICES IN THE NORTHEAST CORRIDOR OVER THE NEXT DECADES. The position paper documents in detail the fact that major Northeast Corridor airports either are now, or soon will be, limited to a finite number of operations, and that demand will far outstrip capacity at major air facilities throughout the Corridor. High speed rail - with no dependence on radical or extraordinary technology - can provide that capacity with the 120 mph service already proven and accepted on the southern half of the Corridor for a significant series of inter-city pair markets. We must establish this consistent level of service as our first inter-city high speed infrastructure priority. In addition, and in parallel, we must aggressively pursue the task of making existing air services work better. We must proceed with a program to encourage a coordinated schedule of larger (and quieter) airplanes making more efficient use of existing airway capacity. Finally, we must expand the role of a network of reliever airports which have the double benefit of decongesting our most capacity-constrained airports, and providing for a better origin-destination pairing for the travelling public.

Each of the methods of supplying desperately needed capacity in the NE Corridor - air, rail and highway - must be fully utilized to its potential if we are to sustain the exceptional economic resurgence now being felt throughout the Northeast Corridor. To deny the major role of any of these modes would be a tragic mistake.

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OVERVIEW: THE ECONOMIC BASIS FOR INCREASED NORTHEAST CORRIDOR TRAVEL. During the last decade economic growth in the Northeast corridor has reached record levels. Recently, articles have begun to appear in the New York Times and a wide variety of regional newspapers hailing a new boom in the economies of New England and New York. This renaissance has been attributed to a wide variety of factors including the emergence of high technology and an explosion of growth in the financial and service industries. These events are generally viewed as good news for the region's residents, especially since this period of new activity follows upon an era of economic decline in New England. Certainly no one would complain about a robust regional economy and low unemployment. But with favorable economic tidings, there have also come new signs of stress and strain on the region's transportation system.

Air travelers between Boston and New York sometimes face long delays in the air and even longer delays on the ground. It is not unusual for a business traveler on the way to an important meeting to be hopelessly late, held up for many hours in the air or stuck in traffic trying to get from the airport. Daily commuters and intercity drivers compete with one another for space on the region's roadways bringing motorists to a crawl on an interstate system designed for high speed travel.

For the Northeast, the risks of continuing in this way are too large to ignore. Without a well thought out strategy for improving the region's transportation system, this new turnaround in our economy may prove short lived. The region's economy may choke itself, strangled by an inadequate transportation system. Major corporations and businesses may look for new homes elsewhere, such as the Sun Belt where very different basic density and infrastructure conditions predominate.

In order to understand the nature of the impending crisis before us, it is necessary to examine how the region is structured, economically and geographically; that is at the root of the problem.

The original vision of a Northeast Corridor "Megalopolis" has already materialized. The area between New York and Boston is a chain of interconnected cities and towns stretching along Long Island Sound and extending up the Connecticut River Valley. By the 1960's urban planners and national policy makers began to speak increasingly about a future Megalopolis -- a single city that would stretch from Washington to Boston by the end of the Century with the suburbs of one often blending with the suburbs of the next.

In the last few years that vision of the future has already begun to become real. Most of the major cities in the Corridor experienced rapid new development in the last decade. New office towers have continued to proliferate in Manhattan while Boston has experienced a phenomenal increase in both downtown and

PAST AND PROJECTED GROWTH
IN TOTAL PERSONAL INCOME,
EASTERN SEABOARD
(CONSTANT DOLLARS)

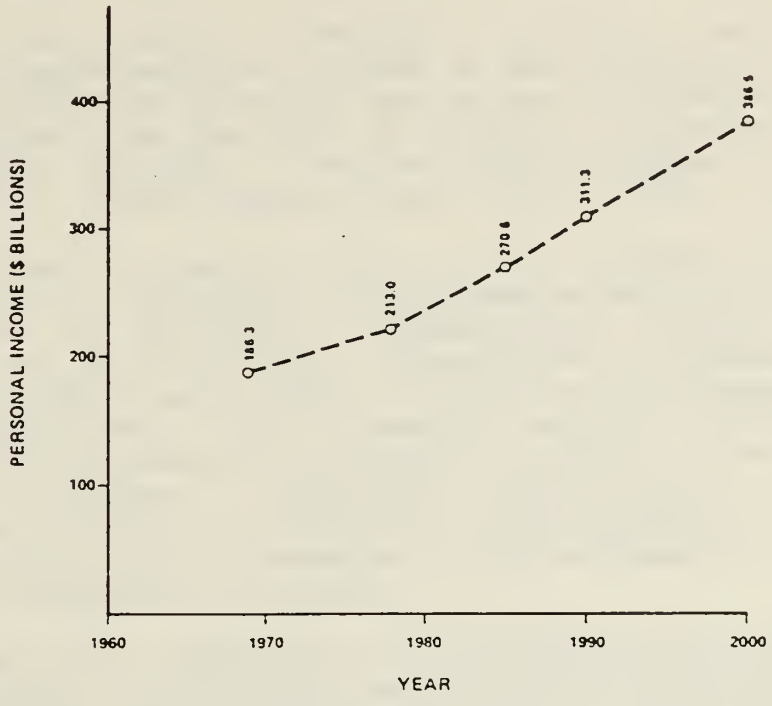


Figure 1 Reproduced from FRA, 1985

suburban construction. Boston's skyline has risen to new heights while new development has pushed outward to I-495 and beyond. New office buildings and downtown redevelopment are also underway in Providence and Hartford and their suburbs.

Notwithstanding early demographic studies forecasting economic stagnation for the area, economic change has radically increased our inter-city transportation demand. Much of the transportation growth in the region has occurred without substantial change in population. Population growth has remained almost flat over the last decade in the Boston/New York corridor while construction has soared and combined air and rail travel between the two cities has leapt by over 43% Most of the activity appears to be the result of economic change, face-to-face business interconnections and proximity. Figure I, reproduced above, shows that -- in spite of only "modest" increases in population -- Northeast Corridor personal income continues to rise dramatically.

An example of this is the profound change in the character of the Boston area economy. Boston is now one of the largest financial services centers in the Nation. This represents a substantial shift away from the predominantly manufacturing economy of the past. This change means that the type of activity that goes on in Boston is now closely related and interconnected with the activity occurring in New York. Hence, it appears reasonable

that travel between these centers would have increased to the extent that it has.

And Boston is not alone. Greenwich, Stamford, Hartford and Providence have experienced an influx on new corporate headquarters and an explosion in financial and related business services. The chain of cities from New York to Boston is becoming a corporate and financial corridor. And with this change has come a pronounced rise in travel demand within the corridor.

The kind of economic complex that we are becoming is heavily dependent on travel. The kinds of businesses which are developing here require an excellent transportation system and will continue to do so in the future. Executives in Boston's major financial institutions need travel as well as telecommunications to interact effectively with financial markets in New York. Companies like GTE in Boston may require frequent travel to their headquarters in Stamford. Financial institutions in New York have business with those in Providence and Hartford. Computer, medical and biotechnology companies in Massachusetts have frequent business throughout the region.

The cities, towns and businesses of Southern New York and New England have become increasingly interlinked and interdependent. With this has come an increasing reliance and increasing strain on the region's transportation system. Without any joint strategy for the future, our regional economies could falter as the advantages of proximity and shared resources become strangled by a congested and unbalanced transportation system.

The Northeast Corridor between New York and Boston has only three major means of transportation: air, road and rail. Today the airports and roadways carry the vast majority of business travelers in the region. The roadways are filled by local travel demand leaving increasingly less room for rapid intercity travel. As documented in the following pages, many major NE Corridor airports are <u>already</u> at capacity, with no growth planned. The significantly underutilized potential of the existing rail corridor must now be brought into play. The original goals of the Northeast Corridor Project must be attained. The nationally agreed upon policy goal of attaining full Northeast Corridor high speed rail service has been ignored and abandoned. Electrification and the attainment of improved track right of way conditions have been part of a national commitment dating back to the mid-seventies. The original program of continuous, high speed rail from Boston to Washington <u>must</u> be completed as planned. The unfinished program leaves us with the same anachronistic system of two technologies which we inherited from the bankrupt railroads: one system from Boston to New Haven, and a separate system from New Haven to Washington.

TABLE 2-3 AVERAGE MINUTES DELAY BY PHASE OF FLIGHT: TOTAL SYSTEM: SDRS CARRIERS COMBINED*

Flight Phase:	1976	1978	1980	1982	1983	1984
ATC Gate Hold	0 06	0.12	0.17	0.84	0.56	0.69
Taxi Out	4.46	4.78	5.10	6.25	6.24	6.53
Airborne	4.28	4.36	4 13	2.50	3.76	4.00
Taxi-In	2.16	2.41	2.43	2.32	2.38	2.37
Average per flight	10.96	11.67	11.82	11.91	12.44	13.59
Average per Operation	5.48	5.83	5.91	5.96	6 22	6 80

*Source: FAA Office of Aviation Policy and Plans.

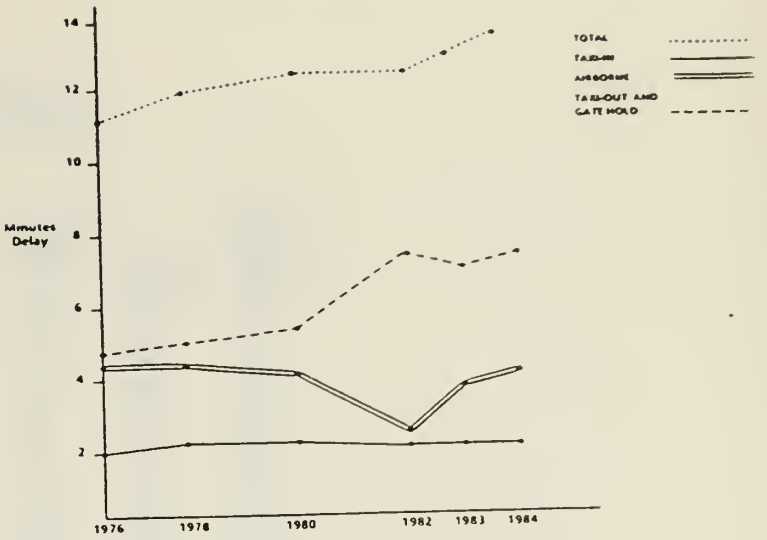


FIGURE 2-3 TRENDS IN DELAY BY PHASE OF FLIGHT SDRS DATA

Reproduced from FAA 1976
Figure 2

OUR PRESENT SYSTEM IS FRAGILE AND IS EASILY DISRUPTED. It does not take a major snowstorm to destroy reliable air service in the Northeast Corridor. In fact, it does not even take the closing of one of the airports. Laguardia airport radically loses operational reliability with the simple fog that accompanies a common rainfall. Back-ups caused at New York airports can destroy the reliability of interconnecting services throughout the Northeast Corridor. Operations at National Airport are routinely disrupted by very small amounts of snow throughout the winter months, even on those occasions when the airport remains open. Even a moderate disruption of one of these critical hub airports can translate into a system-wide paralysis felt throughout the Eastern United States.

Will these problems go away? The most recent FAA studies make clear that this is not likely. The FAA's 1986 Airport Capacity Enhancement Plan reports that "60-70% of reported delays have been attributed to weather." [page 2.5] The 1986 study concludes:

> "Some portion of the delay-related cost may be unavoidable. For example, there may be little that can be done within the foreseeable future to counter the lengthy and expensive delays resulting from severe weather." [page 2-19]

THE TREND OF INCREASE IN AIRPORT DELAY. For our purposes, airport delay is a symptom of the problem of congestion growing over time. In fact, the use of average values in such statistics tends to understate the severity of serious incidents - merging

ACTUAL AND PROJECTED GROWTH IN OPERATIONS AT 34 PRIMARY COMMERCIAL AIRPORTS 1983-1995
(Thousands of Operations)

AIRPORTS	TOTAL OPERATIONS FY 1983	ACTUAL 1984	FORECAST OPERATIONS FY 1995	FORECAST % CHANGE 83-95	% FORECAST GROWTH ALREADY ACHIEVED BY 1984
Chicago O'Hare	659.3	713.4	906	37.4	21.9
Atlanta	599.5	666.1	765	27.6	40.2
Los Angeles	498.1	543.1	629	26.3	34.6
Denver	466.8	488.3	602	29.0	15.9
Dallas-Ft Worth	426.8	503.7	543	27.2	66.2
San Francisco	349.0	401.3	395	13.2	113.6
St Louis	343.3	392.6	460	34.0	42.4
New York Kennedy	342.1	360.6	370	8.2	65.8
Miami	341.2	354.9	438	28.4	14.1
Phoenix	341.1	391.1	491	43.9	33.5
New York LaGuardia	340.4	362.1	335	-1.6	n.a.
Boston	340.3	380.5	469	37.8	31.2
Houston	330.9	321.0	489	47.8	-6.3
Washington National	327.4	321.0	405	23.7	19.8
Honolulu	326.7	342.8	450	37.7	13.5
Philadelphia	321.4	343.4	444	38.1	14.7
Pittsburgh	315.0	349.5	425	34.9	31.5
Houston/Hobby	309.8	328.4	419	35.2	17.0
Dallas/Love	302.1	319.7	511	69.1	8.4
Minneapolis	300.3	330.8	455	51.5	19.8
Las Vegas	297.2	296.6	438	47.4	-0.4
Memphis	292.5	297.3	420	43.6	3.7
Charlotte	280.7	308.4	414	47.5	20.8
Salt Lake City	273.1	251.1	428	56.7	-14.3
Tampa	272.1	294.7	365	34.1	24.3
Detroit Metro	271.4	316.8	420	54.8	30.5
Newark	263.9	335.5	350	32.6	106.4
Baltimore-Wash	239.1	278.1	390	63.1	25.8
Ft Lauderdale	236.4	238.5	330	39.6	0.3
Cleveland	211.3	240.7	315	49.1	28.3
Seattle-Tacoma	209.7	220.2	264	25.9	19.3
Indianapolis	175.9	189.2	260	47.8	15.8
Dulles	158.9	176.2	329	107.0	10.2
Kansas City	147.6	190.4	271	83.6	34.6

Figure 3 Reproduced from FAA 1986

as it does the commonplace annoyance event with the incidents of paralysis and near paralysis for the system. Over time the issue is becoming more serious - both in terms of frequency of occurrence. First, let us address frequency of occurrence. The FAA reports that "the number of delayed operations was 37% higher in 1985 than in 1983." [emphasis in original] [page 2-6]. Volume-related airport delays were 25% more frequent in 1985 than in 1983, [falling from a massive rise in 1984.] Second, we can observe trends in the duration of the individual incidents of delay. Figure 2 reproduced on the previous page shows a pattern of continuous increases in the duration of delays from 1976 to 1984 where the average delay reached about 14 minutes. The chart shows that between 1980 and 1982 there was a sharp rise in the propensity for a flight to be held on the ground, rather than in the air, but the general growth trend of delay by all causes is nearly linear.

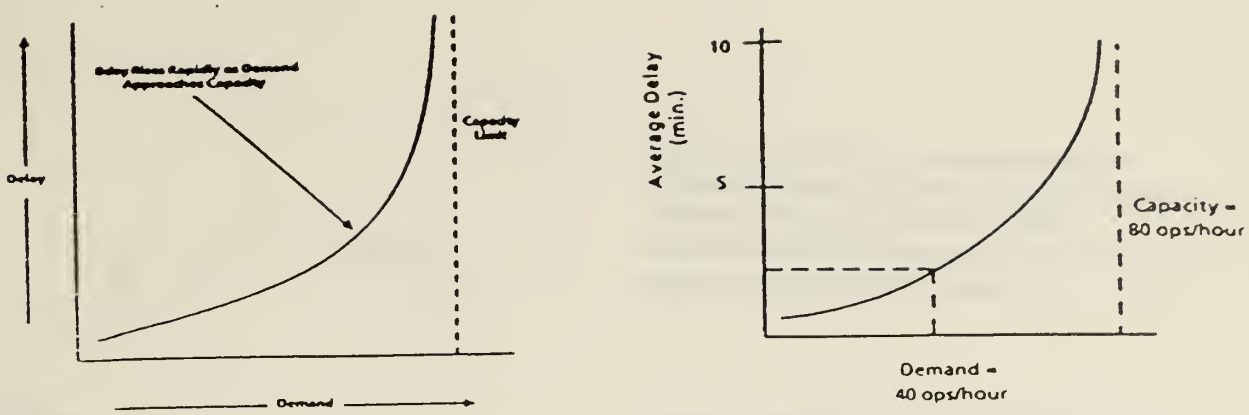
In short, the frequency of occurrence of serious delay continues to rise and the duration of those delays continues to increase. The FAA reports that over 90% of flights do not take off on time, having been delayed in taxiing. As summarized by FAA, "...congestion is not simply a problem of a small number of flights delayed for long periods of time, but that many, perhaps most, flights encounter some delay at major airports." [page 2-8]

The problem of congestion at Northeast Corridor airports is not going to go away, and this vitally affects the future of Boston - New York city-pair. There was a time when ever increasing airside capacity was an assumption. That time is past. The Port Authority of New York and New Jersey spent years looking for a suitable location for a "fourth-jetport." Today a fourth jetport is not even under active consideration. In the NEC airports, particularly in the New York area, capacity is already an issue which is being dealt with. LaGuardia Airport is simply not expected to accept any additional flights. Figure 3, reproduced from the 1986 FAA document suggests it should actually decline by 1.6% from present volumes to be consistent with FAA's 1995 projections. These same studies show that Newark Airport had already grown to 106% of its 1995 forecast growth by 1984. [page 2-15].

Delays at these major centers are already built in assumptions for the experienced traveler. The FAA has calculated that in 1984 the average delay per flight was 14 minutes. In 1984 data, about 15% of planes at LaGuardia experience delays of longer than 15 minutes. Clearly the reliability characteristics of these services will pose an increasingly severe problem as we approach the end of this Century.

DEREGULATION HAS NOT SOLVED THE AIRPORT CONGESTION PROBLEM. In response to the pressures and opportunities created by the airline Deregulation Act of 1978 (Public Law 95-504, 92STAT.1705), domestic airlines have consolidated operations into a relatively small number of hub airports generally located in the mid west which are fed by a larger number of origin or traffic generating airports at the ends of "spokes" feeding the hub interchange locations. This has enabled carriers to maximize their on-line traffic by keeping connections focused on airports which each individual carrier dominates. This hub and spoke operation has also allowed carriers to maintain relatively higher flight frequencies than could be sustained by more traditional line-haul route structures. In many cases established carriers have added secondary hubs at new locations, each requiring feed from the "origin" airports at the end of new spokes. The airline demand characteristics associated with these deregulation practices have affected the "origin" airports such as Boston, LaGuardia, Washington-National by increasing the number of flights to these multiple hubs and by a steady reduction in the size of airplanes serving these hubs in order to maintain the necessary flight frequencies to multiple points. The nationwide trend has been clearly reflected in airline fleet purchase decisions which are increasingly biased toward having fewer seats than in the past. The passenger load per flight leaving Logan is now less than it was five years ago.

TRENDS IN SAFETY CONSIDERATIONS. It does not take very much foresight to see that the opportunities to create new airports or to materially expand the capacity of existing airports in our



INTERRELATIONSHIP OF DELAY, DEMAND, AND CAPACITY

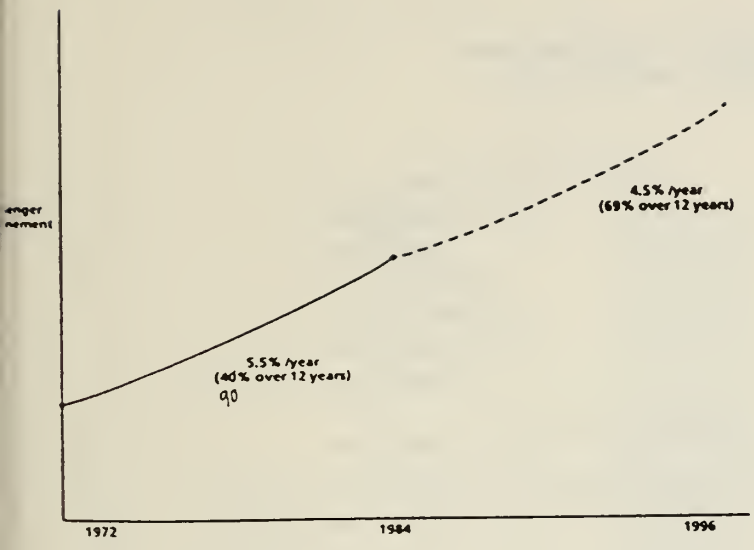
The number of operations an airport actually processes usually is less than the airport's maximum throughput capacity.

Reproduced from FRA 1986

Figure 4

older northeast corridor cities are extremely limited. The trends discussed in this paper and the limitations on airport capacity in our older cities will almost certainly lead to increased congestion and delay. The Federal Aviation Administration regularly limits activity at several of the Nation's busiest airports, including LaGuardia, Washington-National and JFK through the imposition of quotas designed to limit flight activity and congestion to levels which can be safely accommodated by federal air traffic control personnel. Nevertheless, concerns over the negative impacts upon safety of the growth in air traffic activity generally are real and have been documented in a report by the General Accounting Office to the Secretary of Transportation as recently as this past spring. In this report the authors essentially conclude that this growth has caused controller work load to reach a point where the present system does not provide the same level of safety as existed before the August 1981 Air Traffic Controllers strike. The report includes recommendations that the FAA impose restrictions on air traffic and increase staffing levels at its facilities. It is likely that safety concerns can only worsen in the future as we experience the increased level of air traffic and accompanying congestion that is being predicted for all of the major air carriers airports in the northeast.

THE RELATIONSHIP OF DELAY TO GROWTH IN AIRPORT OPERATIONS. There should be no belief that continued growth of airport operations will not lead to increased delay. The relationship of "demand" and "capacity" to delay is eloquently stated in FAA's 1986 "Enhancement Plan" document. As reproduced as Figure 4 above,



Domestic passenger enplanements are expected to grow by an average 4.5 percent annually between 1984 and 1996; enplanements in 1996 are expected to be 69 percent above the 1984 level.

Aircraft operations at towered airports are expected to increase by 62 percent between 1984 and 1995.

Reproduced from FAA, 1986

FIGURE 2-5 TRENDS IN ENPLANEMENTS

Figure 5

the first figure shows how "Delay Rises Rapidly as Demand Approaches Capacity." As the level of demand asymptotically approaches the capacity of the airfield, a small increase in operations causes a major increase in delay. The second figure shows an example. Here "demand" of 40 operations per hour cause an average delay of two minutes. Looking at the upper right hand corner of the curve, we find that even small additions to operations approaching the theoretical capacity of the airport bring about a sharp increase in resultant delay. These simple graphics, prepared by the FAA, eloquently set the stage for understanding the nature of the problem already being experienced at the major Northeast Corridor airports, and show the inevitable implications of steadily increasing demand.

GROWTH. The FAA forecasts that aircraft operations at major American airports will grow by 62% between 1984 and 1995, as shown in Figure 5. The implication for Northeast Corridor is severe and more immediate: major airports of the Northeast corridor just can't accept such an increase, if they can accept any at all. The FAA 1986 study concludes "at a few of the most active and congested airports - Washington's National, New York's LaGuardia and New York's Kennedy - only modest growth, or even a slight decline in operations is projected, because these airports already are used intensively and cannot accommodate large increases in traffic levels given current facilities and technologies." This point was made exceedingly clear in FAA Administrator Engen's speech of July 2, 1986 in which he suggested that similar flight restrictions may be imposed in the next five years in Boston, Denver, St. Louis, Los Angeles and Austin.

Destination of Domestic Carrier Flights from Logan International Airport

New York City Airports	37.9%
Washington D.C.	5.5%
Chicago	4.9%
Los Angeles	4.1%
San Francisco	3.7%
Philadelphia	2.9%
Baltimore	2.7%
Northeast Corridor Airports	49 %

Source: Massport, Third Quarter 1983. (Recent trends have continued in the direction of increased number of flights to NYC.)

Figure 6

Thus, for the first time in our experience, we are hearing of a Federal interest in putting a "cap" on Logan's operations much as has already happened at National and LaGuardia Airports. To better understand the nature of such an upper threshold level, we have begun to undertake a Logan Airport Growth Policy Study, which will examine in a public process the logical constraints to growth.

For the Corridor, the basic problem should be clear. The demand for additional long distance travel will soon exceed the ability of all of the major Northeast Corridor airports to deal with it. Using definitions established by FAA, the FAA 1986 study concludes that projected 1995 volumes will exceed desirable capacity characteristics by 55% at Logan, 36% at LaGuardia and JFK, and 48% at Washington National. While the acceptance of these definitions of desirable capacity is beyond our needs in this paper, the data serves to reaffirm that the airports of the Northeast Corridor are facing extremely difficult conditions in the decade ahead and that this condition holds particularly true for the Boston/New York City pair.

THE CONTRIBUTION OF THE BOSTON/NEW YORK MARKET TO THE LOGAN CONGESTION PROBLEM IS STAGGERING. There is a finite amount of capacity available for intercity scheduled flights. And, at present, about 40% of the scheduled domestic flights that leave Logan go to one place, New York, as shown Figure 6. An additional percentage go to the rapidly growing markets of Bridgeport, Stamford and New Haven. In total, more than half of Logan's domestic carrier operations are destined for the Boston-Washington corridor. Thus, both now and in the future we find that air travelers who have no realistic alternative to air travel are held circling over the area as 4 or 5 planes land from the same place at the same time.

EXAMPLES OF TOTAL TRAVEL DEMAND INCREASE IN THE NEC 1976 THROUGH 1983

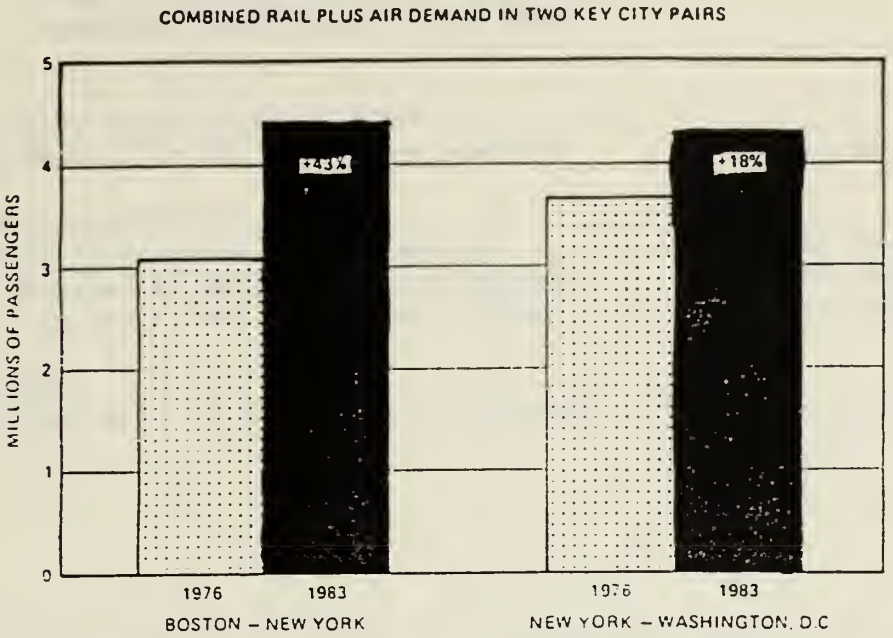


Figure 7

Reproduced from FRA 1985

A BALANCE OF RESOURCES IS NEEDED. This Position Paper does not conclude that the completion of the Northeast Corridor High Speed Rail Project is the only solution that must be pursued. Rather, we find that of the three possible modes in the Northeast Corridor - highway, air, and rail, it is rail that has an almost unlimited capacity to grow to meet the increased demand for appropriate city-pair travel, particularly for the market between Boston and New York. Completion of the original Northeast Corridor Program, with 3 hour travel from Boston to New York should be the flagship of a total program to increase the efficiency of our scarce intercity travel infrastructure. We in the Corridor must also work to provide incentives as appropriate to provide air service in larger aircraft, thereby accommodating the same (or a growing) number of travelers in the same (or a decreasing) amount of air capacity. We know that we can do this for the New York-Boston city pair; and the concept seems to have validity for other major O-D routes as well. And, finally, we should aggressively expand the use of appropriate reliever airports. The traveler whose destination is Worcester simply doesn't want to be going to Logan, and using up its finite capacity. The consequence of a policy of encouraging the growth of reliever airports has the double benefit of removing traffic from congested airports, and

"Improved" N.E. Corridor Trip Times
compared with Historic Trip Times

"Metroliner Service", Improved Track, 1983	
Boston (South Station) to New York (Penn Station)	3 hours 55 minutes
Turbo Train Service 1969-1973	
Boston (Back Bay) to New York (Grand Central)	3 hours 39 minutes
Boston (South Station) to New York (Grand Central)	3 hours 44 minutes
Boston (South Station) to New York (Penn Station)	3 hours 50 minutes
1950's Service NYNH&H	
Boston (South Station) to New York (Grand Central)	4 hours 0 minutes

Figure 8

creating a more direct origin - destination pairing for the traveling public.

THE POTENTIAL ROLE OF BOSTON/NEW YORK RAIL SERVICE: DEMAND. The economic inter-relationship of Boston and New York is tremendously strong. Between 1976 and 1983 the total passenger volume (rail and air) between the two cities increased by 43% to about 4.5 million passenger trips today. This is somewhat higher than the second strongest city-pair demand volume, New York-Washington, as shown in Figure 7.

Currently Amtrak captures about one trip in four between the cities of New York and Washington. If Amtrak could attain the same market share for the Boston-New York route, ridership would triple over present levels.

RAIL TRAVEL TIMES. In terms of rail travel times, the unfinished Northeast Corridor Project has left us with little to show for efforts. With the new track, the best scheduled Boston to New York running time was 3 hours and 55 minutes, as shown on Figure 8. In 1973, the best running time was 3 hours and 50 minutes. [Both counted as South Station to Penn Station]. Figure 8 shows how the Turbotrain timetables compare with the present service, which averages about 4 hours and 20 minutes. The timetables of old New York, New Haven and Hartford railroad clearly put the present performance to shame.

In the earlier days of the Northeast Corridor planning, expectations were high. Consistent with this spirit the United Technologies Corp. of Hartford developed the Turbotrain in the late 1960's. This vehicle incorporated two principle strategies:

1) its propulsion system allowed for good acceleration, and did not require a cumbersome change of equipment at New Haven.

2) It incorporated the principle of "tilting" technology to allow faster negotiation of the Shore Line's tortuous curved track.

In a decade, our vision has gone backwards, when compared with that of the United Technology Corp. Let it be explicitly stated, of course, that the Turbotrain had some very real problems. The operating experience allows us to conclude that this (non-electrified) propulsion system is not the right system for the Corridor. The Turbotrain consumed too much fuel, and developed problems in the reliability of its propulsion system. But these observations should not be used as our excuse to ignore the obvious implications of the the Turbotrain experience: that appropriate propulsion and vehicle design can significantly improve travel time even holding track conditions as a constant.

ACTION NEEDED. The Boston-New Haven right-of-way must receive full electrification, as planned, throughout the project. That electrification provides the optimum propulsion system for this form of high speed rail is uncontested: it is the propulsion system which has been selected in virtually all high speed systems in Europe and Japan.

Equally clear is that Federal decision makers must re-open their now-closed eyes on the subject of vehicle technology. "Tilting" vehicle suspension systems are not a panacea that can solve all high speed problems. Highly advanced forced mechanical systems have proved problematic in prototype applications in Britain and elsewhere. But neither is the concept of tilting suspension totally new or untried. The Talgo Train, which utilizes a tilting suspension system originally developed in America for use on the Boston-New Haven right of way, is in operation in France and Spain, has carried over 470 million passengers miles, and boasts a 97% vehicle availability factor. This train incorporates a very basic pendular suspension concept which minimizes the impacts of curving alignment at speeds of up to 100 mph, based on tests made at speeds of up to 143 mph. Other high speed passenger rail equipment incorporating this concept is presently being manufactured by one of the largest rail equipment manufacturers in North America, which owns a major car production plant in Barre, Vermont, near Montpelier.

The present Federal Railway Administration is not pursuing this, or any other, appropriate possible breakthrough in vehicle technology. And yet, the FRA's draft nine year study reports that tilting vehicles could theoretically save 25 minutes over and above the savings by conventional equipment at 120 mph service.

FIGURE 9

	CAPITAL COST IN MILLION	MINUTES SAVED	RUNNING TIMES BOSTON/NEW YORK
1986 NECIP COMPLETION*	$"0"	"0"	3 hrs. 58 min.
ELECTRIFY NEW HAVEN/ BOSTON *	$400	44	3 hrs. 14 min.
ELECTRIFY and STRAIGHTEN CURVES*	$600	49	3 hrs. 09 min.
ELECTRIFY, STRAIGHTEN and USE TILT TECHNOLOGY**	$650	"58"	"3 hours"

*Source - FRA Figure reproduced as Figure 12. Appendix to this Report.

**Source - EOTC composite assuming less than one half the theoretical benefit of tilt technology.

Figure 9 has been prepared from data included in FRA's Draft of a Nine Year Report, prepared June 1985. That document reported that "theoretically" tilt technology could save 25 minutes from Boston to New York. This table assumes a savings of only 9 minutes from a very rudimentary application of the concept. This analysis suggests that with some appropriate combination of alignment improvement and modest improvement of vehicle technology, electrified service could be provided on the existing Shore Line with a three hour running time. An additional ten minutes could be gained from full 160 mph technology, but not along the existing Shore Line right-of-way. Clearly, the 120 mph option is the most worthwhile candidate for further policy attention.

Three hour service with true reliability is directly competitive with air services and their continued problems with reliability. "Door to door" travel times for air service have been conservatively estimated at 3 hours and 15 minutes. Clearly, the three hour train service would provide door to door travel times for some major market segments that are superior to air travel times. For example, commuters with direct access to Route 128 station would have superior travel times to <u>many</u> Corridor destinations. Similarly, true "downtown to downtown" [Back Bay

to Madison Square Garden] trips would experience actual time superiority in most cases.

WHERE SHOULD THE MONEY BE SPENT? FRA studies that electrification and a series of small improvements can shave 44 minutes off of the base case Boston to New York Travel Time. By contrast, the existing track between New York and Washington is already at a significant plateau of 120 mph service. Thus, a similar amount of investment would produce about 13 minutes of improvement between New York and Boston. Phrasing the same thing differently, FRA's Nine-Year Study shows that the New York-Boston electrification package would produce improvements at a cost of $9 million per minute saved, while a similar scale package in New York-Washington would cost $23 million per minute saved. [Source Tables 7-4, 7-6] The specific numbers are not critical; rather, the conclusion is that electrification to Boston is the most cost effective remaining major investment in the full Corridor.

WHERE SHOULD RESEARCH BE CONCENTRATED? Each major transportation right of way has its own particularly unique challenge. The challenge of Shore Line from New Haven to Providence is clearly that of an exceptionally poor alignment, formed more by the craggy coastline than by any desired engineering characteristics. The NECIP project studies clearly show that for an investment of approximately $200 million, certain curves could be upgraded in support of 120 mph speeds, with a resultant gain of 5 minutes. The same NECIP study reports that successful implementation of tilt suspension vehicles could theoretically save 25 minutes between Boston and New York, as reproduced as Figure 10. Most NEC trains are through-routed to Washington, where they could save an additional 7 minutes. Thus, purchasing a modest number of these train sets for high-speed "premium" service could theoretically save 32 minutes, within the basic 120 mph concept. Additionally, the application of new vehicle technology could serve to minimize the need for track re-alignments.

WHAT ABOUT "TGV" TYPE SERVICE? The service difference between the basic 120 mph now in operation on the Corridor, and 160 mph service of the TGV concept is perhaps less than might be anticipated. Between Boston and New York 160 mph vehicles would save 18 minutes over the 120 mph concept - but much of the alignment through Connecticut would have to be abandoned. Perhaps three billion dollars would have to be invested to save this 18 minutes, compared with the $600 million to save 49 minutes, to attain the 120 mph concept. The right-of-way and environmental consequences of such a new alignment (along the median strip of Route 95, for example) have to be understood before this last increment of speed is considered. By contrast, the successful harnessing of the tilt suspension concept would allow the existing rail alignment to remain in use. Between New York and Washington, the 160 mph concept would save only 7 minutes over the full 120 mph alternative which is available. It must be understood that full TGV-type technology requires complete separation from freight and local service, which could

TABLE 7-2

THEORETICAL EFFECTS OF TILT VEHICLES ON NEC TRIP TIMES

	Time savings (minutes) over conventional equipment	
	At 120 mph maximum speed	At 160 mph maximum speed
NEW YORK - WASHINGTON	5 to 7	12 to 15
NEW YORK - BOSTON	25	not applicable; requires new right-of-way

Note: The above savings would be dependent on the development of economical, reliable equipment meeting the very high standards necessary to operate comfortably and safely at speeds of 120 mph or higher.

Reproduced from FRA, 1985

Figure 10

have massive implications for the busy joint-use rail right of way between New York and Washington, with capital requirements reaching to the billions of dollars. The concept advocated in this position paper - 120 mph service with improved vehicle characteristics to minimize curve reconstruction - is consistent with requirements of shared rail rights of way.

PUBLIC POLICY MUST REALIZE THE POTENTIAL OF BOTH RAIL AND AIR. We should not waste our time with a technological debate about rail vs. air. This makes no sense, and just serves to divide us. Rail and air systems should all play a complementary role in a regional transportation policy. Air travel is important to our economy; within the context of strict environmental policy, we expect air travel volumes to rise considerably to serve our expanding state economy. Many many national city pairs - such as Boston-Chicago, Boston-Cleveland, Boston-Detroit (etc.) are not served well by rail service, and national policy acknowledges this with the modest amount of subsidized service provided. But travel which can reasonably occur in a general three-hour time envelope is a classically good market for high speed rail services, with their high quality city-center to city-center service characteristics.

The two modes are not incompatible. In Switzerland, which has a major national airline, rail services are an active part of the air transport program. The basement of Geneva Airport is the eastern terminus of the national main line high speed rail service. The basement of the Zurich Airport is a western terminus of the same high speed rail corridor. The result? When a plane to Geneva is rerouted because of winter weather conditions the plane is sent to Zurich. There passengers are immediately placed on the high-speed train to Geneva, where they can continue with their connections as planned. All of this takes place with coordination based on years of experience in operating the planes and trains together as one system which benefits the taxpayers and stimulates the national economy. Every timetable published by Swissair around the world includes the full railroad schedule from its airport rail stations.

The Swiss capital city, Berne, has no airport. The international traveler benefits from fast rail connections directly into the terminals of both Zurich and Geneva airports. The citizens of Berne can choose from the combined schedules of the two major airports. He can check in his bag to any flight in Switzerland right at the train station - in fact in any train station in Switzerland! Similarly, the West German capital city, Bonn, has no major international airport. The train service direct to the basement of the Frankfurt Airport terminal is so popular that Lufthansa (the German Airline) actually operates a popular train service in competition with that of the German Federal Railroad. A Lufthansa through ticket from Boston to Bonn includes two "flights": one of which just happens to be on high-speed rail. Throughout Europe high speed intercity rail service is seen as an absolutely essential complementary service to longer distance air service, part of an integrated national transportation system.

HIGHWAYS AS AN ALTERNATIVE FOR HIGH SPEED TRAVEL. The discussion of the use of highways to provide for a major increase in high speed travel capacity in the Northeast Corridor should be mercifully short. The lack of available excess highway capacity for this purpose should be obvious to all. Figure 11 shows a sampling of actual and forecast highway volume changes along the corridor.

In Boston, our Interstate Highway System funnels its patrons onto a short stretch of road that experiences level of Service E or below from 6 AM to 8 PM. This is true today, and shows no signs of getting any better. This piece of Interstate Highway has a daily traffic volume which is twenty times its practical hourly capacity, - [highways are normally expected to carry only ten times their normal peak hour capacity.] This is not to argue that all the major trunk roads of the Northeast Corridor are experiencing this kind of complete paralysis. Rather, the experience along our Interstate 93 can be used by other cities to forecast what will be happening - sooner or later - throughout the Corridor.

Clearly each state and region will be devising its own strategies to deal with the coming crisis of urban highway traffic volume increases, and many of these will result in workable transportation system management strategies to allow priority traffic movement to continue. To expect, however, that these contiguous urban expressway systems will be able to provide a continuously available right-of-way to accommodate the coming growth in longer distance travel, with the reliability demanded by this kind of travel, is unrealistic. Each of the separate urban areas is now facing the reality of forecast traffic volumes far beyond their reasonable capacity levels. To pretend that these roads will magically become available for high speed intra-corridor travel makes no sense.

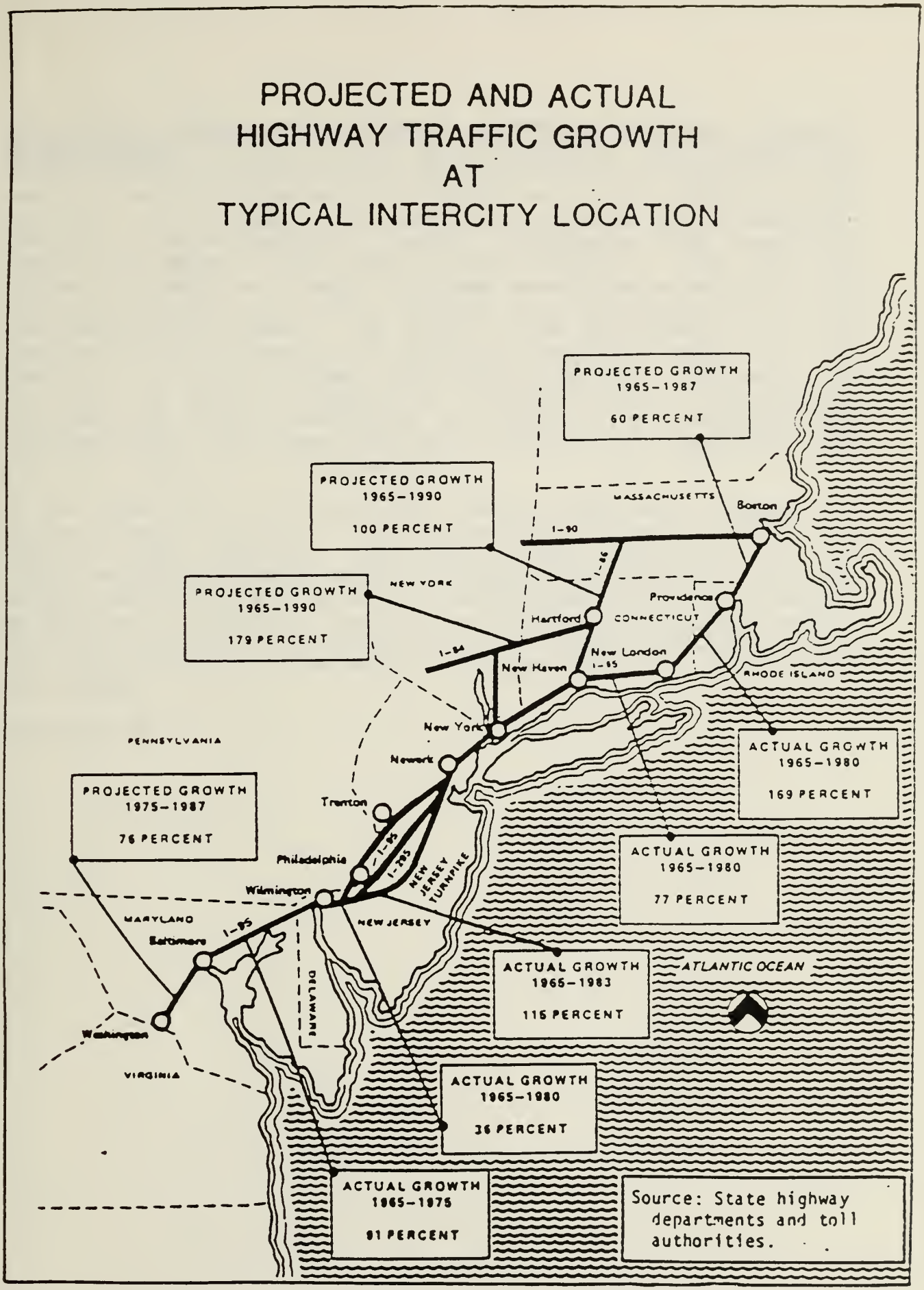


Figure 11

Reproduced FRA 1985

CONCLUSION: GOALS FOR IMPROVING NORTHEAST CORRIDOR INTERCITY TRANSPORTATION. Public policy should establish the attainment of a 120 mph electrified rail system from Boston to New York, with running time of approximately 3 hours as a major infrastructure priority. Such a service is directly obtainable for a reasonable cost, and establishes full system continuity with operations already in place in the rest of the Corridor. Over the next decade it should be possible to shave some 55 minutes off of the Boston-New York run, and a further 13 minutes off the New York-Washington segment. The goal is the attainment of a high quality 120 mph electrified system throughout, with continued sharing of the right of way with other vital rail services. The Corridor-wide goal is realistic, and depends on no breakthrough in terms of either technology or right of way environmental considerations. The need for policy action on completing this project is immediate and pressing.

At the same time, the Northeast States must work together to attain higher levels of utilization and efficiency from our existing major airports. The most basic coordination of air flight scheduling could result in higher load factors, and fewer flights devoted to medium-haul intra-Corridor service. Likewise, we must work together to fulfill the promise of the many smaller "reliever" airports to provide direct service for smaller planes. All of these steps are necessary to improve the total capacity of our system.

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FIXED PLANT IMPROVEMENT OPTIONS, NEW YORK - BOSTON

Option Number	Option Description[c]	Fixed Plant Capital Costs $ Millions	Trip Time Savings Minutes	Dollars Spent (Millions) on Fixed Plant per Minute Saved	Resultant Trip Times [a] (hours:minutes) Station to Station	Door to Door [b]	Airline Trip Times (Door to Door)[b]	Approximate Door-to-Door Rail Time Advantage (Disadvantage) vis-a-vis Air
N1	1986 Project: fixed plant at completion of NECIP	0	0	n/a	3:58	4:53	3:15	(1:38)
N2	Upgrade New Rochelle-New Haven segment (requires cooperation of Metro-North)	60	18	3.3	3:40	4:35	3:15	(1:20)
N3	Electrify between New Haven and Boston (includes Option N2)	400	44	9.1	3:14	4:09	3:15	(0:54)
N4	Electrify and realign simultaneously between New Haven and Boston for 120 mph speeds (includes Option N2)	600	49	12.2	3:09	4:04	3:15	(0:49)
N5	160 mph system	3,000	67	44.8	2:51	3:46	3:15	(0:31)

[a] These are best trip times and assume 4 stops. Any of these options could include nonstop service between New York and Boston, with a 10 minute improvement in trip times; but the rail disadvantage vis-a-vis air would still be 21 minutes even in Option N5.

[b] Based on Table 3-1.

[c] Option N1 and N2 assume existing vehicles. Option N3 and N4 would extend electrified service with AEM-7 locomotives over the whole route. Option N5 assumes new 160 mph non-tilting vehicles. All options add vehicles in future years in accordance with demand increases. The capital costs for these vehicles figure in the comprehensive financial analysis later in the chapter but are excluded from Tables 7-4 through 7-8.

Appendix

Figure 12

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